

THE DISCOVERY OF THE FEMALE GAMETOPHYTE AND CARPOSPOROPHYTE IN *LOMENTARIA ORCADENSIS* (RHODYMENIALES, RHODOPHYTA)

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Lomentaria orcadensis (Harvey) Collins ex Taylor is a rhodophycean alga in which gametophytic and carposporophytic stages have not been identified until now, only tetrasporophytes being known. According to Svedelius (1937), in the life history of this species only apomeiotic processes occur. Sporophytes give rise to diploid tetraspores without meiosis, in other words, this species shows an haplobiontic life cycle in contrast to the diplobiontic one present in other species of *Lomentaria*. He said: "*Lomentaria orcadensis* (as *L. rosea*) exists as a sexless, purely diploid member of Rhodophyceae with tetrahedrally arranged diploid spores". This opinion was later strengthened by Foran & Guiry (1983), who, examining the alga in culture, found that isolated tetraspores of this species gave rise to new tetrasporophytes with similar morphology to the parent plants. On the contrary, Crouan & Crouan (1867), Segawa (1936) and Lodge (1948) reported supposedly gametophytic plants of *L. orcadensis*. However, according to Irvine & Guiry (in Irvine, 1983) their records are probably based on other species of *Lomentaria*. For instance, small distichous plants of *L. clavellosa* are difficult to distinguish from *L. orcadensis* (Irvine & Guiry in Irvine, 1983).

The finding in the northwestern Iberian Peninsula of gametophytic plants clearly belonging to *L. orcadensis* proves the ability of this species to show a *Polysiphonia*-like life history.

Gametophytic plants were collected in March 1994 at the Sisargas Islands (northwestern Iberian Peninsula, 43°21' N, 8°49' W) at 8 meters of depth, on vertical rocks covered by sponges, the female thalli living together with tetrasporophytic ones. Epilithic plants of *L. clavellosa* var. *pyramidalis* Thuret ex Le Jolis were collected nearby. The latter are easily distinguishable from the former by their size, habit and basal attachment. The plants of *L. orcadensis* are much smaller, with very flattened erect fronds and an extensive, branched, stoloniferous holdfast. We have not found any thallus with an intermediate morphology between both species.

The specimens were preserved in 4% formalin seawater. For anatomical study they were embedded in gelatine, dried and hand-sectioned. The sections were soaked

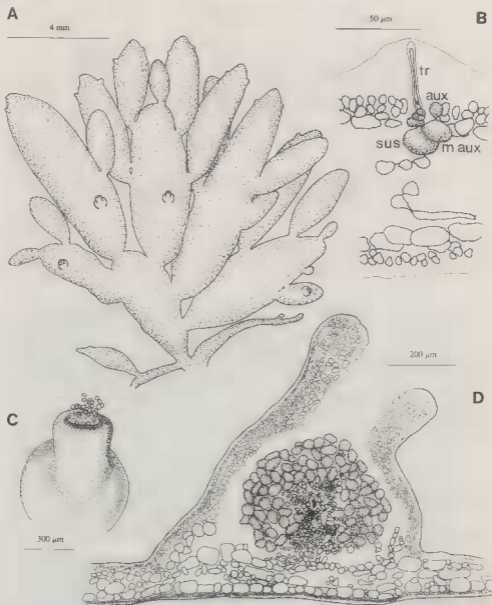


Figure 1. *Lomentaria orcadensis* (SANT-Algae 6435). A. female gametophyte with cystocarps turned towards branch apex. B. procaryp (tr, trichogyne; sus, supporting cell; aux, auxiliary cell; m aux, mother cell of auxiliary cell). C. cystocarp with a prominent pore. D. cross section of cystocarp showing its asymmetric shape, gonimoblast and thick pericarp.

in distilled water, mounted in 20% Karo[®] syrup and stained with aniline blue. The line-drawings were made using a camera lucida. The herbarium sheets have been deposited at the herbarium of the University of Santiago de Compostela (SANT-*Algae* 6435, female gametophyte; 6509 and 6518, tetrasporophytes).

The morphological and anatomical vegetative structure of female gametophytes and tetrasporophytes is the same, as in other species of *Lomentaria*. Procarps are located subapically on the axis of young branches. Because of the mainly apical growth of the thallus, the cystocarps become central on the branches. The supporting cell (similar to other cortical cells) carries a 3-celled carpogonial branch and the mother cell of a terminal auxiliary cell. The external cystocarps, up to 4 on both sides of the branch and 400-600 μm in diameter, are conical or hemispherical, with a thick cortical pericarp and a prominent asymmetric carpostome turned towards the branch apex. Carposporangia are angular or rounded, up to 50 μm in diameter. Male gametophytes have not been seen. The morphology of procarps, cystocarps and carposporophytic stages is similar to other *Lomentaria* species previously described by Lee (1978).

The presence of female gametophytes with cystocarps on the northwestern Iberian Peninsula probably confirms the observation of plants $n = 10$ and $n = 20$ on the french coast (see Magne, 1964). In conclusion, *L. orcadensis* seems not to have lost completely the ability to show a *Polysiphonia*-like life history, trigenetic, diplobiontic and isomorphic. It is probable that gametophytes of this species are rare or infertile in northern latitudes.

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